

CLAIMS

1. A transimpedance amplifier, comprising:
a substrate;
5 an amplifier circuit formed on said substrate;
a photodetector pad for connection to an external photodetector;
and
an auxiliary photodetector formed on said substrate adjacent to
said amplifier circuit.
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2. The transimpedance amplifier of claim 1, where said auxiliary
photodetector does not significantly affect high speed performance of
said transimpedance amplifier.
- 15 3. The transimpedance amplifier of claim 1, wherein said substrate
comprises at least one of silicon, silicon-on-insulator, gallium
arsenide, indium gallium arsenide, and indium phosphide.
- 20 4. The transimpedance amplifier of claim 1, wherein said amplifier
circuit comprises at least one of metal oxide semiconductor, metal
semiconductor, bipolar junction transistor, and heterojunction bipolar
transistor.
- 25 5. The transimpedance amplifier of claim 1, wherein said auxiliary
photodetector comprises one of a P-N photodiode, a P-I-N photodiode, a
metal-semiconductor-metal photodetector and an avalanche photodetector.
- 30 6. The transimpedance amplifier of claim 1, wherein said auxiliary
photodetector comprises a structure similar to that of a standard
electro-static discharge diode.

7. The transimpedance amplifier of claim 1, wherein said auxiliary photodetector is provided at an input of the transimpedance amplifier in parallel with attachment points to the external photodetector.
- 5 8. The transimpedance amplifier of claim 1, wherein said auxiliary photodetector is provided to facilitate contact-less probing at input points of the transimpedance amplifier to test the transimpedance amplifier at wafer level.
- 10 9. The transimpedance amplifier of claim 1, wherein said auxiliary photodetector is optically excited to test the transimpedance amplifier at wafer level.
- 15 10. The transimpedance amplifier of claim 9, wherein said auxiliary photodetector is excited using short wavelength light.
- 20 11. The transimpedance amplifier of claim 9, wherein said auxiliary photodetector is excited by illumination, and the transimpedance amplifier is tested by detecting an output of the transimpedance amplifier.
- 25 12. The transimpedance amplifier of claim 11, where said output is detected by probing a supply voltage and detecting switching currents passing through a bias tee using a spectrum analyzer.
- 30 13. The transimpedance amplifier of claim 11, where said output is detected using a high gain antenna and a sensitive narrow band receiver.
14. The transimpedance amplifier of claim 11, where said output is detected using a high speed electrical probe by either direct contact or capacitive proximity coupling.

15. A method of testing a transimpedance amplifier at wafer-level,
comprising the steps of:

inserting a transimpedance amplifier, the transimpedance
amplifier comprising a substrate, an amplifier circuit formed on said
5 substrate, a photodetector pad for connection to an external
photodetector, and an auxiliary photodetector formed on said substrate
adjacent to said amplifier circuit;

probing power and ground connections of said transimpedance
amplifier;

10 illuminating said auxiliary photodetector with modulated laser
light deflected by optical beam splitters; and
detecting output of the transimpedance amplifier.

16. The method according to claim 15, wherein said output is detected
15 using a high speed electrical probe by either direct contact or
capacitive proximity coupling.

17. The method according to claim 15, wherein said output is detected
using a directional high gain antenna and a sensitive narrow band
20 receiver.

18. The method according to claim 15, wherein said output is detected
by probing a supply voltage of the transimpedance amplifier and
detecting switching currents passing through a bias tee using a
25 spectrum analyzer.

19. The method according to claim 15, wherein said transimpedance
amplifier comprises an array of transimpedance amplifiers.

30 20. The method according to claim 19, wherein said illuminating said
auxiliary photodetector further comprises selectively illuminating
individual auxiliary photodetectors with modulated laser light
deflected by said optical beam splitters.

21. The method according to claim 20, wherein said laser light is steered to selectively illuminate said auxiliary photodetectors without moving said power and ground connections of said transimpedance
5 amplifiers.

22. The method according to claim 20, further comprising applying beams having different frequencies while being within a passband of the transimpedance amplifier.
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23. A testing system for testing a transimpedance amplifier at wafer-level, the transimpedance amplifier comprises a substrate, an amplifier circuit formed on said substrate, a photodetector pad for connection to an external photodetector, and an auxiliary photodetector formed on
15 said substrate adjacent to said amplifier circuit, the testing system comprising:

at least one probe for probing power and ground connections of said transimpedance amplifier;

an illumination system comprising optical beam splitters for
20 illuminating said auxiliary photodetector with modulated laser light deflected by said optical beam splitters; and

a detection device for detecting output of the transimpedance amplifier.

24. The system according to claim 23, wherein said detection device comprises a high speed electrical probe by either direct contact or capacitive proximity coupling.
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25. The system according to claim 23, wherein said detection device comprises a directional high gain antenna and a sensitive narrow band receiver.
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26. The system according to claim 23, wherein said detection device comprises a bias tee, and said output is detected by probing a supply voltage of the transimpedance amplifier and detecting switching currents passing through a bias tee using a spectrum analyzer.
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27. The system according to claim 23, wherein said transimpedance amplifier comprises an array of transimpedance amplifiers.
28. The system according to claim 27, wherein the modulated laser light deflected by said optical beam splitters selectively illuminate individual auxiliary photodetectors.
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29. The system according to claim 28, wherein said laser light is steered to selectively illuminate said auxiliary photodetectors without moving said optical beam splitters or said probe.
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30. The system according to claim 28, wherein said laser light comprises beams having different frequencies while being within a passband of the transimpedance amplifier.